

CAUSE OF SUDDEN FALL IN BLOOD-PRESSURE
WHILE EXPLORING THE COMMON
BILE-DUCT.*

BY J. LOUIS RANSOHOFF, M.D.,
OF CINCINNATI, OHIO,

THE essential feature or symptom of shock is a fall in blood-pressure, which may be due to one or many causes. Recent experiments, particularly by Crile, have shown that in most cases shock is due to vasomotor paralysis from excessive nervous stimulation. Shock in abdominal operations is more marked in the upper regions of the abdomen, increasing as the diaphragm is approached. Mayo has noticed the great liability to shock in operations and manipulations of the common duct. All operators of any experience agree that during these operations the pulse may suddenly become rapid and small, and the respiration shallow and frequent. These symptoms have been attributed to a temporary vasomotor paralysis due to excessive insult to the great splanchnic plexus of sympathetic nerves.

We began this series of experiments with the preformed idea that these symptoms were dependent on the overstimulation and insults to the sympathetic nerves, but we soon learned that our premises were wrong. Rabbits of a uniform size were the subjects of these experiments. They were in all cases anesthetized with ether before beginning the operation. Under complete anesthesia the trachea was exposed and the breathing cannula inserted. This was connected with a bottle and the anæsthetic continued in this way. The carotid was then exposed and a glass cannula introduced connected with a Hürthle manometer. The records were taken on smoked paper on a revolving drum of the Porter model.

* From the Physiological Laboratory of the Medical College of Ohio, University of Cincinnati.

Respirations were not recorded as the apparatus markedly interfered with carrying on the experiment. Twenty-five experiments were made in all.

In the earlier experiments, various manipulations were made in the region of the pylorus, the duodenum and the common duct. These manipulations had no effect on the blood-pressure, with the exception of a slight and gradual fall. The manipulations were made as follows:

1. Opening of the abdomen, resulted in a very slight fall with a quick return to the normal pressure.
2. Traction on the gall-bladder, no effect.
3. Traction on the pylorus and thus on the gastrohepatic.
 - a. Traction in a pedad direction, no effect.
 - b. Traction in a ventrad direction, slight fall.

Although difficult to prove, it seems from subsequent experiments, that the fall in blood-pressure in ventrad traction of the gastrohepatic omentum is due to a slight kink of the portal vein and interference with the return flow.

4. Vigorous sponging in this region resulted in a slight and gradual fall.

In the second series of experiments, the pylorus was isolated and the tip of the small finger was introduced into the foramen of Winslow. Care was taken that no pressure was made on the vena cava. In each case at the instant of introduction of the finger into the foramen of Winslow, a sudden and marked fall of blood-pressure with rapid and small pulse was noticed. The fall ranged from twenty to forty millimetres of mercury. The blood-pressure continued at this low ebb as long as the finger was held in the foramen. As soon as the finger was removed, the blood-pressure arose to its previous level. The results in these experiments were absolutely constant. For example experiment No. 12:

Full-grown rabbit in good condition; ether anaesthesia, tracheal breathing cannula and cannula in carotid. Initial blood-pressure 80 mm. of mercury. Abdomen opened in epigastric region, pressure 75 mm. The tip of the little finger was now introduced into the foramen of Winslow and held there ten seconds. Blood pressure, 40 mm. The finger was now removed and the blood mounted to 80 mm. After allowing the blood-

pressure to regain its normal level, the finger was again introduced into the foramen and held in place for twelve seconds, with a resulting fall to 40 mm. After removing the finger the pressure rose rapidly to 80 mm. This manoeuvre was repeated several times with like result; the animal then killed. The accompanying tracing (Fig. 1) showed the experiment in detail.

In another experiment, a hook was introduced into the foramen of Winslow and upward traction was made with the same result as in the preceding experiment. This was done to make sure that no pressure had been made upon the vena cava.

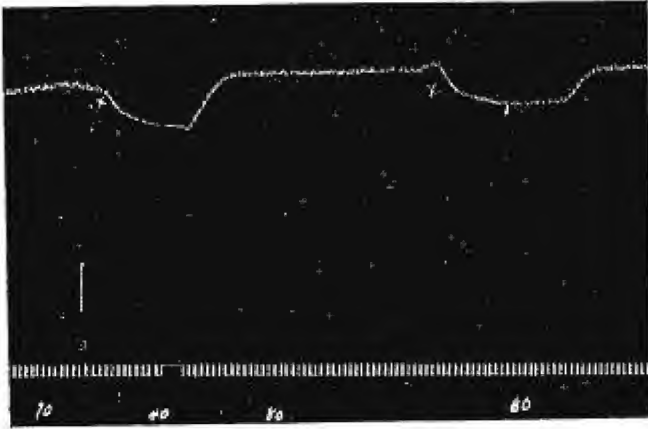
A series of control experiments was now made. The gastrohepatic omentum was now exposed and the portal vein was isolated as far as possible. The vein was now temporarily clipped and the same drop in blood-pressure was noted, except that the drop was more marked.

Experiment 15. Full-grown rabbit, ether anaesthesia, tracheal breathing cannula, cannula in carotid artery; pressure, 105 mm. The portal vein was now exposed, during which manipulation slight variation in blood-pressure was noted. A temporary clip was now applied and left in place for twenty-two seconds. The blood-pressure fell to 50 mm. The clip was now removed and the pressure gradually rose to 100 mm. The animal was then killed. The accompanying tracing (Fig. 2) is a graphic record of this experiment.

Control experiments were now made in the operating room on human subjects, and in each case the same result was obtained. The Recklinghausen tonometer was used. The following is typical of the results obtained:

Mrs. S., aged 40. Diagnosis: Stone in common duct. Operation at Jewish Hospital by Dr. Joseph Ransohoff, November 27, 1907. Gas-ether anaesthesia, initial blood-pressure 110 mm. Abdomen opened, pressure dropped to 105 mm. Gall-bladder freed from adhesions, no change in blood pressure. Finger introduced into foramen of Winslow in search of stone in common duct, and resulted in a prompt fall of the blood-pressure to 70 mm. Finger removed and blood-pressure rose to 105 mm. During the subsequent course of the operation, this manoeuvre was repeated with like result (see Fig. 3). The stone was found in the common duct, and the operation concluded with hepatic drainage.

FIG. 1.



Tracing of experiment No. 12.

FIG. 2.



Tracing of experiment No. 13.

It will be seen from these observations that the marked fall in blood-pressure occurred when the common duct was explored by introducing the finger into the foramen of Winslow. In this manipulation the structures in the gastrohepatic omentum are lifted in the crook of the exploring finger and inadvertently the portal vein is compressed. This partially closes its lumen, resulting in the shutting off of a great quantity of blood from the general circulation and the consequent lowering of blood-pressure. That the fall of blood-pressure occurs at the instant of the introduction of the finger into the foramen of Winslow, and in every case remains at the low level while the finger is held in place. The fall of blood-pressure is due entirely to pressure on the portal vein is conclusively shown by experiment 15, in which the portal vein was clamped and an immediate fall occurred.

Knowing as we do the results of this pressure on the portal vein, I think that the digital exploration of the common duct should be intermitted at short intervals to allow the circulation to regain its normal tone.

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